Small-scale Forestry
https://doi.org/10.1007/s11842-022-09507-x

ORIGINAL RESEARCH

Nonindustrial Private Forest Landowners (NIPF) Willingness to Pay for Forest Certification in Arkansas

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Accepted: 21 February 2022

Abstract

Forest certification is a global voluntary, market-based approach to promoting sustainable forest management. A major barrier for small landowners like nonindustrial private forest (NIPF) landowners in the southeastern United States to participate in this program is certification costs. We conducted a mail survey of NIPF landowners in Arkansas to uncover whether they are willing to pay for forest certification and factors that influence their willingness to pay. Most of these landowners were not familiar with (68.7%) nor interested in (51.4%) forest certification. Younger or well-educated landowners and those with a higher household income, having a desire to protect nature and biodiversity and wildlife, or having received information or professional advice about forest management were more likely to pay for the certification. A clear picture also emerged of how these landowners desired to be educated about certification via both active and passive education methods. Our findings indicate that there is limited potential for expanding the participation of the NIPF landowners in the existing forest certification programs. A large-scale expansion, however, would require forest certification programs to effectively address the certification cost barrier and to incentivize those who desire to protect nature and biodiversity as well as privacy.

Keywords NIPF landowners · Forest certification · Certification cost · Privacy · Southeastern United States

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Introduction

Forest certification, a voluntary and market-based approach to promoting sustainable forest management, has been adopted unevenly across countries and landowner groups (Fernholz et al. 2021). Compared to other types of forest landowners, small family forest landowners are less likely to participate in this global initiative so far. For instance, up to 2017, 51% of forests in Canada were certified, whereas only 13% in the U.S. were enrolled in certification programs (U.S. Endowment for Forestry and Communities 2020). One argument for the lower adoption rate of forest certification in the U.S. is because the majority of U.S. forestland is owned by nonindustrial private forest (NIPF) landowners. Approximately 58% of forests in the U.S. are privately owned, with 38% controlled by NIPF landowners (Oswalt et al. 2019), whereas nearly 94% of forests in Canada are publicly owned (Natural Resources Canada 2020). The low participation rate of NIPF landowners has hindered the expansion of forest certification in the U.S. and other countries with large shares of forestland owned by small private landowners.

A number of studies have explored landowners' awareness and perceptions of and attributes toward forest certification as well as barriers for them to participate in forest certification. Although the findings from these studies are mixed and diverse in general, some consensus has emerged. Earlier case studies suggested that most of the NIFP landowners were unfamiliar with or unenthusiastic about forest certification (Vlosky 2000; Newsom et al. 2003). Among the landowners participating in forest certification were those who were more likely to have a higher education level or household income (Ma et al. 2012; Tian et al. 2018a), to be female (Kline et al. 2000; Knoot et al. 2015), and to possess larger forest tracts (Tian et al. 2018a; Tian et al. 2021). Additionally, landowners' occupation and whether to have a forest management plan, to have received professional advice on forest management, or to be engaged in timber production were also found to be correlated with their participation in forest certification (Bell et al. 1994; Nagubadi et al. 1996; Ma et al. 2012; Tian et al. 2018a, b).

Several barriers to adopting forest certification have also been identified, including certification costs, more restrictive forest management requirements, and lack of sufficient price premiums for certified wood products. While consumers' willingness to pay for certified wood products has risen gradually over time, it varies across markets and is generally low (Cai and Aguilar 2013). The lack or low level of price premiums reduces the benefits or incentive for landowners to adopt forest certification (Rickenbach 2002; Kilgore et al. 2007; Leahy et al. 2008; Tian et al. 2018a). Forest certification may require landowners to meet additional or higher requirements established by certification programs, such as a written forest management plan (Bensel 2001; Kilgore et al. 2007; Tian et al. 2018a, b). The majority of NIPF landowners in the U.S. do not have a written forest management plan (Butler et al. 2020), and they considered this requirement an additional cost or inconvenience for adopting forest certification (Kilgore et al. 2007; Leahy et al. 2008). High certification costs have widely been perceived as an obstacle to forest certification (Hayward and Vertinsky 1999; Bensel 2001; Rickenbach 2002; Kilgore et al. 2007; Perera et al. 2007; Leahy, et al. 2008; Zhao et al. 2011; Ma et al. 2012; Chen and Innes 2013; He et al. 2015;

Tian et al. 2018a, b). The certification costs per unit of forest area certified are especially high and may become unbearable for many NIPF owners as nearly 90% of them control less than 20.2 ha (50 acres) in the U.S. (Butler et al. 2020).

Although certification costs are especially critical for NIPF landowners to adopt forest certification, in-depth studies on this topic are lacking. We attempt to bridge this knowledge gap by surveying NIPF landowners in Arkansas. These landowners surveyed are typical NIPF landowners in the southeastern U.S. where over 60% of U.S. domestic timber supply is sourced (Wear and Greis 2013). Like many other states in the southeastern U.S., over half (58%) of forestland in Arkansas is owned by NIPF landowners (State and Private Forestry Fact Sheet 2021). Additionally, Arkansas lies on the west bank of the Lower Mississippi River, and its forests provide timber and diverse non-timber ecosystem services including water regulation, wildlife habitats and biodiversity, carbon, and natural sceneries. Provisions of these ecosystem services rely on sustainable management of forest resources, especially forests controlled by NIPF landowners in the region.

The main objective of this study is to assess the likelihood of NIPF landowners in Arkansas to pay for forest certification and factors that influence their wiliness-to-pay. Our findings shed new light on the willingness of the NIPF landowners to participate in forest certification in general and the certification cost barrier for these landowners in particular. Although the NIPF landowners share many of the sustainable forest management objectives emphasized by the exiting certification programs, certification costs, as well as other concerns such as privacy, hunting/fishing, and enjoying the natural scenery, will remain major obstacles for their participation in forest certification.

Methods

Survey Sampling

Mail surveys were primarily used in this study for data collection to allow a large geographical coverage of Arkansas state in a cost-effective manner. The database of NIPF landowners' mailing addresses was purchased from Dynata Inc., and only landowners who own at least 10 acres of forestland were targeted in the survey. Prior to implementation, the survey was reviewed and approved by the University of Arkansas at Monticello's Institutional Review Board (IRB# FNRf-01). In October of 2020, 4000 landowners were sent a questionnaire of state-wide forest certification survey. On the cover page of this survey, the landowners were assured of the confidentiality of their information and voluntary of their participation. The Dillman Tailored Design method was followed (Dillman 2000). Two hundred and ninety-eight of the questionnaires were determined ineligible because of undeliverable addresses, death, etc., and were removed, bringing the eligible population to 3,702. The received usable returned questionnaires was 562, yielding a total response rate of 15.2%.

In the survey, participates were asked their willingness to pay (WTP) to have their forestland certified. It was a multiple choice question consisting of different amounts of WTP including $0, $50, $75, $100, $150, and $200. Their response to this question

was further classified into two categories (Yes/No) using a binary variable, which became the prominent dependent variable in this study. All respondents who chose \$0 was grouped as No (i.e., not willing to pay anything for the certification) while the others who were willing to pay any positive amount for the certification were grouped as Yes.

Other questions included in the survey were grouped into the following three sections: (1) forestland and ownership characteristics, which comprised of forestland size, tenure, acquisition mode, whether having a forest management plan, timber harvest plan, future ownership plan, as well as motivations of owning forestland; (2) landowners' perspectives (1 = not at all useful, 5 = very much useful) for various learning methods for forest certification, which included talking to a forester/professional, talk to other landowners, forestry field trip, workshop, webinar/video conference, publications/books, newsletter/magazines/newspapers, videotapes for home watching, television/radio programs, as well as the website of explaining the process; and (3) sociodemographic information including age, gender, household income, and education (Table 1). It took respondents about 20 min to finish the survey.

Analytical Methods

To test for differences in WTP among continuous variables of age, ownership size, and tenure, analysis of variance (ANOVA) was employed. In addition, to examine correlations between ordinal/categorical variables with WTP, Chi-square (Eq. 1) tests were employed. All results were reported as statistically significant when $P \leq .05$.

$$x^2 = \sum_{i=1}^{n} \frac{(O_i - E_i)^2}{E_i} \tag{1}$$

where x^2 is Chi-square, O_i is the observed value and E_i represents the expected value.

The sociodemographic group consisted of age, gender, education level, and household income. Previous studies revealed that demographic variables could affect private landowners' participation behavior in forest management certification programs. For example, both Tian et al. (2018a, b) and Ma et al. (2012) reported that landowners with higher education levels are more willing to participate in forest management certification programs. Therefore, we expected a positive correlation between education and landowners' WTP for forest certification. Likewise, Tian et al. (2018a) found a positive association between income and landowners' interests in adopting a forest certification program, so a positive correlation was also expected in this study. Results from early studies regarding the association between gender and landowners' management decisions are mixed. For example, Tian et al. (2018b) revealed that female landowners were less inclined to participate in forest certification programs, whereas other studies like Knoot et al. (2005), Van Herzele (2009), and Tian et al. (2015) indicated that female landowners were more concerned for environment issues and exhibited more interests in adopting environment-friendly programs. Hence, it is

Table 1 Descriptive statistics of sociodemographic, forestland and ownership characteristics

Characteristic	Mean	Standard Deviation (Std.)	N
Dependent variable of WTP			
1 = Yes (19.8%) 0 = No (80.2%)	0.20	0.40	524
Demographics			
Age (years)	61	13.51	528
Gender (%) 1 = Male (69.9%) 0 = Female (27.9%) 2 = Prefer not to answer (2.2%)	0.74	0.49	538
Education level (%) 1 = less than 12th school (3.6%) 2 = high school/GED (23.5%) 3 = some college education (25.3%) 4 = have an associate degree (9.4%) 5 = have a bachelor's degree (21.8%) 6 = have an advanced degree (16.5%)	3.72	1.52	533
Household income level (%) 1 = Less than $20,000 (7.4%) 2 = $20,000 - $49,999 (27.8%) 3 = $50,000 - $79,999 (26.8%) 4 = $80,000 - $100,000 (13.8%) 5 = More than $100,000 (24.1%)	3.20	1.29	514
Forestland and Ownership Characteristics			
Tenure of ownership (years)	33.2	30.8	546
Forest acreage/ownership size (acres)	74.5	216.0	545
Acquisition mode (%) 1 = purchase (82.1%) 2 = inherit (17.9%)	1.30	1.19	541
Whether landowners received management advice from others (i.e., foresters, state agencies, etc.) (%) 1 = Yes (51%) 2 = No (49%)	1.49	0.50	561
Timber harvest intention/plan (%) 1 = Yes (12.9%) 2 = No (63.2%) 3 = Not sure (23.9%)	2.11	0.60	549
Whether having a forest management plan (%) 1 = Yes (19%) 2 = No (81%)	1.81	0.39	548
Future ownership plan (%) 1 = continue for self-manage it (51.7%) 2 = sell it (5.1%) 3 = pass it on to family (41.3%) 4 = others (1.8%)	1.93	1.00	549
Familiarity level with forest certification (%) 1 = not at all familiar (68.7%) 2 = slightly familiar (14.7%) 3 = somewhat familiar (9.5%) 4 = moderately familiar (4.2%) 5 = extremely familiar (2.9%)	1.58	1.02	549

Table 1 (continued)

Characteristic	Mean	Standard Deviation (Std.)	N
Interest level in participating in a forest certification program (%) 1 = not at all interest (54.1%) 2 = slightly interest (21.9%) 3 = somewhat interest (12.3%) 4 = moderately interest (8.9%) 5 = extremely interest (2.8%)	1.84	1.12	538

difficult to expect the sign between gender and landowners WTP. Similarly, it is hard to expect a correlation sign between age and WTP.

The second category included tenure, ownership size, acquisition mode, timber harvesting intent/plan, whether landowners received management advice from other sources (i.e., foresters, state agency, neighbors, etc.), whether having a forest management plan, future ownership plan, and landowners' familiarity and interest level in forest management certification programs. Tian et al. (2018a) reported that landowners with a longer tenure were more interested in participating in forest certification; hence, a positive association was expected between tenure and WTP. Moreover, a positive correlation was hypothesized between ownership size and WTP given that certification cost per unit decreases with ownership size and based on the results reported by Ma et al. (2012), who found that landowners are more inclined to adopt forest certification if they own more forestland. Regarding timber harvesting intent, we expected a positive correlation based on the findings from Tian et al. (2018a) and Ma et al. (2012), who reported that landowners are more interested in having their forestland certified if they are planning to harvest timber. We hypothesized a positive correlation between the variable of having received management advice from professionals with WTP given the results reported by Tian and Pelkki (2021), who found that landowners exhibited more interests in forest certification if they received management advice before. A positive correlation sign was expected between whether having a forest management plan and WTP based on the results reported from Bell et al. (1994) and Tian et al. (2018a), who found a positive relationship between having a management plan and landowners interest level in forest certification programs. Variables of familiarity and interest level were hypothesized to be positively correlated with landowners' WTP for a forest certification program.

Ownership motivation variables included the importance placed on 13 different items (Fig. 1). Tian et al. (2018a) reported that landowners whose motivation of owning forestland is for timber production were more interested in participating in forest certification. Hence, a positive correlation was expected for the motivation of timber production. A positive correlation was hypothesized for forestland-protection motivations such as biodiversity protection, wildlife habitat protection, nature and scenery enjoyment, and privacy, etc. A negative association was expected for non-forestland-related motivations such as part of the farm, grazing livestock, etc.

In addition, we expected that different information sources or learning methods for forest management certification would correlate with landowners' WTP.

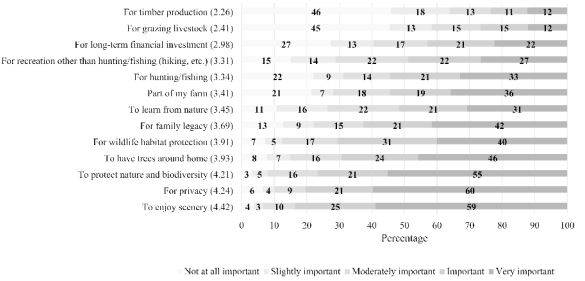

Fig. 1 Descriptive statistics for NIPF landowners' motivations for owning forestland

Results

Respondents' Profile

Of the 562 responded NIPF landowners, 69.9% were male and the average age was 61 years old. Regarding education attainment, 27.1% of the respondents indicated high school or less, 25.3% reported some college education, and the remaining 47.7% indicated at least having an associate degree. There was a wide range of household income levels, 35.2% reported less than $50,000 and 7.4% were less than $20,000, 40.6% indicated their income was between $50,000 and $100,000. The average tenure was 34 years and the average ownership size was 75 acres. The respondents acquired their forestland through purchase mode (82%) rather than inheritance and did not intend to harvest timber in the next five years (63.2%). Respondents largely (81%) did not have a management plan for their forest. When asked about future ownership plans, 52% indicated they would continue to self-manage. Regarding familiarity with forest certification, more than two-thirds (68.7%) reported they were not at all familiar and only 17% of respondents indicated a nominal level of familiarity with forest certification prior to receiving this survey. The majority of the respondents (54%) were not at all interested in forest certification whereas the remaining 46% indicated different levels of interest in participating in forest certification. While the majority of the respondents indicated no interest in certification, their views on the advantages and disadvantages still contribute to the overall success of attracting people to certification. In fact, because our survey respondents consisted of approximately a same proportion of respondents who were interested or not interested in forest certification, our results reflect more balanced perceptions about forest certification.

The questionnaire included a variety of motivations for owning forestland for respondents (Fig. 1). The landowners were asked to indicate the importance level of each item (1 = not at all important, 5 = very important) for their forestland. As demonstrated in Fig. 1, the most important reasons for owning forestland were for scenery enjoyment (4.42), privacy (4.24), and nature and biodiversity protection (4.21). Specifically, as high as 84% of respondents indicated the enjoyment of scenery was very important or important to them; similarly, 81% of respondents reported privacy was very important or important while 71% indicated protecting nature and biodiversity was very important or important. Likewise, owing forestland for wildlife habitat protection (3.91) and family legacy (3.69) were also important reasons; to be specific, about 71% of respondents indicated it was very important or important for wildlife

habitat protection, and 63% of them put very important or important on the family legacy. On the contrary, the least important motivation for owning forestland was for timber production (2.26), only about one-third (33%) of respondents reported it as very important or important.

Significant Correlated Variables with WTP for Forest Certification

ANOVA analysis results were summarized in Table 2. A significant difference was found for age ($p < 0.01$) between two levels of WTP (Yes vs. No). By contrast, no significant differences were found for ownership size ($p > 0.05$) and tenure ($p > 0.05$) among those two levels.

The results of Chi-square tests were summarized in Tables 3, 4 and 5 for potentially associated variables. Among the demographic variables, gender was not significantly related to WTP ($p > 0.05$), whereas a statistically significant positive association was found for both education ($p < 0.01$) and household income ($p <$

Table 2 ANOVA analysis results for age, ownership size, and tenure with WTP

Variables	WTP	Average	p -value
Age (year)	Yes	54.9[a]	<0.01
	No	62.7[b]	
Ownership size (acreage)	Yes	79.9[a]	0.51
	No	67.3[a]	
Tenure (year)	Yes	29.9[a]	0.22
	No	34.1[a]	

Note: a, b in the Average column indicate statistically different at the 0.05 significance level

Table 3 Significant correlations between landowners' demographics, forestland characteristics, and those who are willing to pay for forest certification

Variables	Correlation sign	Chi-square	p -value
Gender	-	1.98	0.37
Education level	+	31.75	<0.01**
Household income level	+	36.61	<0.01**
Acquisition mode	-	0.07	0.96
Whether landowners received management advice from others (i.e., foresters, state agencies, etc.)	+	12.06	<0.01**
Timber harvest intention/plan	-	8.39	0.01*
Whether having a forest management plan	-	3.87	0.049*
Future ownership plan	-	1.61	0.66
Familiarity level with certification programs	+	7.42	0.12
The interest level in participating in a forest certification program	+	115.25	<0.01**

Note: **p<=0.01; * p<=0.05

Table 4 Significant correlations between landowners' motivation of owning forestland and those who are willing to pay for forest certification

Possible motivations of owing forestland	Correlation sign	Chi-square	p -value	N
To enjoy scenery	+	3.83	0.43	543
To protect nature and biodiversity	+	20.42	<0.01**	539
For timber production	+	18.24	<0.01**	530
For long-term financial investment	+	7.67	0.10	532
Part of my farm	–	18.44	<0.01**	542
For family legacy	–	9.65	0.09	542
For wildlife habitat protection	+	15.61	<0.01**	538
For hunting or fishing	+	3.35	0.50	531
For recreation other than hunting and fishing (hiking, family gatherings, etc.)	+	8.11	0.09	530
For privacy	+	1.16	0.88	538
To have trees around home	+	6.07	0.19	534
To learn from nature	+	11.42	0.044*	530
For grazing livestock	–	9.74	0.045*	532

Note: **p<=0.01; * p<=0.05. N: Sample size

Table 5 Significant correlations between landowners' learning methods and those who are willing to pay for forest certification

Possible learning methods	Correlation sign	Chi-square	p -value	N
Talk to a forester/professional	+	22.34	<0.01**	425
Talk to other landowners	+	20.35	<0.01**	439
Forestry field trip	+	16.94	<0.01**	410
Workshop	+	21.19	<0.01**	408
Webinar/video conference	+	22.86	<0.01**	410
Publications/books	+	25.46	<0.01**	420
Newsletter/magazines/ newspapers	+	24.18	<0.01**	417
Videotapes for home watching	+	24.56	<0.01**	409
Television/radio programs	+	26.47	<0.01**	415
Website of explaining the process	+	47.96	<0.01**	412

Note: **p<=0.01; * p<=0.05. N: Sample size

0.01). A significant negative association was found between harvest intention ($p <$ 0.05) and respondents' WTP for forest certification. Similarly, the binary variable of whether having a management plan ($p < 0.05$) was negatively and significantly correlated with respondents' WTP for forest certification. A significant positive correlation ($p < 0.01$) was found between the variable of whether received outside management advice and WTP. Respondents' interest level ($p < 0.01$) in participating in a forest management certification program was positively correlated to their WTP

significantly, whereas no significant correlation was found in their familiarity level ($p > 0.05$) with forest certification

Among different motivation items, significant correlations were found for items of nature and biodiversity protection ($p < 0.01$), timber production ($p < 0.01$), part of farm ($p < 0.01$), wildlife habitat protection ($p < 0.01$), nature learning ($p < 0.05$), and grazing livestock ($p < 0.05$). Of them, motivations including biodiversity protection, timber production, wildlife habitat protection, and nature learning were positively correlated with respondents' WTP for adopting forest certification. On the contrary, a negative association was found for motivation items of part of farm and grazing livestock with the variable of WTP.

Moreover, significant positive associations were found among all possible landowners' learning methods ($p < 0.01$) for forest certification with their WTP (Table 5).

Discussion and Conclusions

While some of our results are consistent with previous studies, we also explored relationships between landowner willingness to pay for certification and a variety of other variables. Our sample of landowners closely mirrored that of the National Woodland Owner Survey (Butler et al. 2020) in terms of demographics and ownership motivations. For example, a similarity in landowners' average age was found when compared to the National Woodland Owner Survey in Arkansas (Butler et al. 2020). To be specific, the average age in our sample was 61 years, close to 67 years in the national survey (Tian and Pelkki, 2021). Primary motivations for most landowners in our survey were focused on amenities, privacy, and nature protection. A minority of landowners in Arkansas (33%) considered timber production very important or important, this proportion was substantially greater than the 10% reported in the national survey (Butler et al. 2020; USDA Forest Service 2021). A decade and a half earlier, the proportion of national landowners citing timber production as their reason for owning forest was around 30% (Butler and Leatherberry 2004). Clearly, the mention of timber production as a reason for owning forest land has declined in recent years.

This declining trend in timber motivation creates a challenge for landowner participation in forest certification. Previous studies (Rickenbach 2002; Kilgore et al. 2007; Leahy et al. 2008; Tian et al. 2018a, b) have identified certification costs and lack of premium as significant barriers. Forest ownerships that do not produce a market good that is in high demand would find justifying the costs of certification difficult. Furthermore, a price premium, even if it existed, would only be available for market good. This implies with the decline in timber motivation, the potential customer base for certification programs may also be declining. It is possible that a certain proportion of amenity-focused landowners would also be interested in certification. However, due to the costs involved, they are more likely to be wealthy landowners with a high conviction for the protection of nature and biodiversity.

Despite over two decades of existence, awareness about certification among landowners is very low (Table 1). This emphasizes the reality that certification programs would still need to do a significant amount of groundwork if they were to increase

participation by private landowners. However, apart from awareness, some logistical issues work as barriers for private landowners. First, the average ownership size for private forests is rather small. Given the costs and the amount of required verification and paperwork, it is prohibitive for most landowners to participate in certification on their own. To counter this barrier and achieve economies of scale, certification programs allow third-party aggregators to recruit landowners who then go through a collective group certification process. An example is the Four States Timberland Owners Association (https://fourstatestimberlandowners.com/). However, given the low awareness levels, it is apparent that there is room for significant public relations efforts. It is also possible that there simply are not enough aggregators. Second, certain strict program requirements may not work for all landowners. For example, the Forest Stewardship Council (FSC) does not certify plantations that replaced a natural forest after 1994. Given that much of the southern private forests are plantations, it does limit available options. For example, based on 2020 FIA data, 6,189,003 acres (2,504,603 ha) of Arkansas are in loblolly/shortleaf pine forests, among which 2,850,523 acres (1,153,567 ha) are natural and 3,338,480 acres (1,351,036 ha) are plantation. Also, some landowners may view certain management requirements as intrusive. For example, FSC has strict restrictions on the use of chemicals, something that is fairly common in southern forest management.

Consistent with earlier studies (Ma et al. 2012; Tian et al. 2018a, b), education and income had a significant positive correlation with the WTP for certification (Table 3). Landowners with higher levels of education are also likely to have higher levels of awareness of forest certification. They are also more likely to understand the details, requirements, and importance of forest certification. Therefore, it is not surprising that they are more willing to pay for certification. Higher-income, on the other hand, is indicative of higher disposable income. Those with high income are also likely to have higher levels of education. Therefore, this group is expected to be more willing to pay for certification.

Landowners who had received management advice from public and private foresters were also found to have a positive correlation with WTP (Table 3). Landowners are much more likely to get accurate and reliable information from forestry professionals. Consequently, these landowners would be more aware of certification and its potential benefits. It is, therefore, logical that these landowners would be willing to pay for certification. Not surprisingly, landowners who showed a higher level of interest in forest certification were more likely to pay for it. A high level of interest is indicative of previous knowledge and familiarity with certification. High interest also implies that these landowners have a positive impression of certification. Intuitively, we would also expect these landowners to be more willing to pay for certification.

Landowners with intentions of harvesting timber and those who had a forest management plan had significant negative correlations with WTP. Although these results may sound somewhat counter-intuitive, they may indicate that landowners' concerns about certification being intrusive and be a barrier to their timber harvesting and other management intentions. Southern landowners tend to have a high level of concern about property rights. They are also highly concerned about privacy, as shown by this and other previous studies. Therefore, any perception of imposing restrictions on their ownership rights by outside entities, whether public or private, is likely to be

viewed with skepticism. Hence, such landowners would likely not be willing to pay for certification. In addition, the economic tradeoff (benefit and cost) of certification is another possible barrier to landowners' willingness to pay for the program (Tian et al., 2017).

"To protect nature and biodiversity" and "For wildlife habitat protection" were significantly correlated with the WTP (Table 4), and over 70% of survey respondents considered these two motivations are very important or important. For these two reasons, certification programs can target this group of landowners for certification expansion. Additionally, "To learn from nature" was significantly correlated with the WTP, which suggests that landowners who were more respectful of nature were more likely to pay for the certification. Landowners who were engaged in forestry production and wildlife protection (timber production or biodiversity protection or wildlife habitat protection) were more likely to pay for the certification. On the other hand, those who indicated "livestock production or part of my farm" were less likely to pay for the certification. However, not many landowners considered timber or livestock production or "part of my farm" as important or very important (Fig. 1). Hence, certification programs can target those who use their land for forestry production, but the room for expanding certification in this group of landowners would be limited because not many of them were engaged in forestry production. While the majority (>80%) of the survey respondents considered "To enjoy the scenery" and "For privacy" as very important or important, these two motivations were not significantly correlated with the WTP. Thus, landowners who wanted to enjoy the natural scenery of their properties by themselves seem to have little motivation to enroll their forests in a certification program. To further incentivize those landowners to participate in forest certification is vital to expanding the adoption of certification programs. For example, policy options for incentivizing landowners can include assistance programs that put teams of foresters together to walk landowners through the process at a nominal cost. It would be of benefit to forest products companies to support these efforts so as to increase the supply of certified wood fiber in their procurement basins. Domtar Corporation did this by funding all the certification work for the Four States Timberland Owners Association (https://fourstatestimberlandowners.com/).

Another possible option is that the state could offer tax incentives by lowering tax rates or even removing the state severance tax from certified lands. The entire purpose of a severance tax is to tax the removal of non-renewable resources, and typically these taxes are applied to minerals. Since certification is a form of sustainability insurance, it makes sense for the state to lower severance taxes on certified timberlands.

For landowners not in timber production, social engineering programs could be used to promote the idea that "certification means greater sustainability and forest health" and that landowners have a societal obligation to certify their forest lands. Property tax assessments could also be a source of incentives for certification. Lowering taxes as an incentive for good environmental behavior could have bipartisan support from the state legislature.

All methods of gaining information had a significant positive correlation with landowner WTP for certification (Table 5). This clearly shows that landowners who are open to learning about forest management issues through any available means are

also more likely to pay for certification. Knowledge is a prerequisite to action and is an influence on behavior. People who are open to learning, are likely to be more accepting of new ideas and concepts. All methods of information delivery have an equally significant positive correlation with WTP.

There is some potential to expand forest certification among the NIPF landowners, but there are challenges for expansion as the majority (51.4%) of the landowners indicated that they were not interested in forest certification. Meanwhile, low awareness of certification programs was another barrier for program expansion among private landowners (Sun et al., 2009). There appear several reasons behind limited program expansion, which may all be boiled down to the net benefit of certification. For instance, those engaged in forestry production were more likely to pay for the certification. These landowners could have more resources to pay for the certification or saw larger benefits from their sales of forestry products by participating in the certification. On the other hand, those who were concerned about privacy, hunting/fishing, and enjoying natural scenery were less likely to pay for the certification. These concerns undermine the potential benefits the landowners could derive from the certification, discouraging their participation in forest certification.

Our findings also suggest that the existing certification programs may need to modify in order to be more widely adopted by the NIPF landowners. These landowners were concerned about privacy and in the meantime, were more likely to adopt the certification if they received advice from professionals. They also will be motivated by the knowledge that without certification, they may not be able to sell wood fiber. Forest certification is an economic development issue for states in the U.S. South as both domestic and global wood markets are requiring certified wood fiber. It seems that if a certification program can ensure the privacy of certified forests/properties and their owners and provide professional advice on sustainable forest management while offering the certification service, it would be more acceptable to the NIPF landowners. Information about how records are kept and the privacy laws surrounding certification could be delivered as a fact sheet or via webinar to landowners. It would also behoove the certification systems to provide assurances about data privacy to landowners and make it very clear that certification does not expose them or their land to public scrutiny. It may actually be in the interest of forest industry associations to assist with and fund NIPF certification programs to attract forest industry to their state.

Our results identified significant demographic and forest management factors that are likely to influence landowner acceptance of certification programs. These significant factors could be used by the certification programs to prioritize their marketing efforts and target landowners who have a higher likelihood of enrollment. Our results also emphasize the need for outreach to raise landowner awareness of forest certification. Overall, the first major concern of landowners about certification is regarding privacy. To address this, we suggest that certification providers clearly explain to landowners their privacy policy and ensure landowners that all data related to privacy will be properly protected. The second concern is certification costs, a barrier to many small landowners. Several measures can and should be taken to lower the certification cost burden to small landowners. For instance, the primary forest industries can offer incentives or landowner assistance for certification; landowners can be

allowed to pool together their lands for certification; and governments can provide tax incentives for certification by lowering tax rates on certified lands. Finally, social engineering/media campaigns funded by the primary industries and environmental groups would also be helpful to enhance landowners' awareness of the certification and its importance, which promote the idea that if you are privileged to own forests, you have a societal obligation to certify the sustainability of a resource you own today as it is important beyond any individual's lifetime.

Acknowledgements We are thankful for the support provided by the College of Forestry, Agriculture & Natural Resources and the Arkansas Center for Forest Business at the University of Arkansas at Monticello in completing this study.

Funding This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declarations

Conflict of interest The authors declare no conflict of interest.

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